

**UTILITY PATENT APPLICATION TRANSMITTAL**  
**(Large Entity)***(Only for new nonprovisional applications under 37 CFR 1.53(b))*Docket No.  
11960.3112

Total Pages in this Submission

**TO THE ASSISTANT COMMISSIONER FOR PATENTS**Box Patent Application  
Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for an invention entitled:

**CONNECTOR SCHEME TO ALLOW PHYSICAL ORIENTATION OF A COMPUTER PERIPHERAL**

and invented by:

**Kenneth S. Morley**  
**Scott M. Christensen**If a **CONTINUATION APPLICATION**, check appropriate box and supply the requisite information:☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: \_\_\_\_\_

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Enclosed are:

**Application Elements**

1. ☒ Filing fee as calculated and transmitted as described below
2. ☒ Specification having thirty-one (31) pages and including the following:
  - a. ☒ Descriptive Title of the Invention
  - b. ☐ Cross References to Related Applications *(if applicable)*
  - c. ☐ Statement Regarding Federally-sponsored Research/Development *(if applicable)*
  - d. ☐ Reference to Microfiche Appendix *(if applicable)*
  - e. ☒ Background of the Invention
  - f. ☒ Brief Summary of the Invention
  - g. ☒ Brief Description of the Drawings *(if drawings filed)*
  - h. ☒ Detailed Description
  - i. ☒ Claim(s) as Classified Below
  - j. ☒ Abstract of the Disclosure

JCE41 U.S. PRO  
09/658108

09/08/00

# UTILITY PATENT APPLICATION TRANSMITTAL (Large Entity)

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## Application Elements (Continued)

3. ☒ Drawing(s) (when necessary as prescribed by 35 USC 113)
- a. ☒ Formal                      Number of Sheets                      four (4)
- b. ☐ Informal                      Number of Sheets                      \_\_\_\_\_
4. ☒ Oath or Declaration
- a. ☒ Newly executed (original or copy)                      ☐ Unexecuted
- b. ☐ Copy from a prior application (37 CFR 1.63(d)) (for continuation/divisional application only)
- c. ☒ With Power of Attorney                      ☐ Without Power of Attorney
- d. ☐ DELETION OF INVENTOR(S)  
Signed statement attached deleting inventor(s) named in the prior application,  
see 37 C.F.R. 1.63(d)(2) and 1.33(b).
5. ☐ Incorporation By Reference (usable if Box 4b is checked)  
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. ☐ Computer Program in Microfiche (Appendix)
7. ☐ Nucleotide and/or Amino Acid Sequence Submission (if applicable, all must be included)
- a. ☐ Paper Copy
- b. ☐ Computer Readable Copy (identical to computer copy)
- c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

## Accompanying Application Parts

8. ☒ Assignment Papers (cover sheet & document(s))
9. ☐ 37 CFR 3.73(B) Statement (when there is an assignee)
10. ☐ English Translation Document (if applicable)
11. ☐ Information Disclosure Statement/PTO-1449                      ☐ Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Acknowledgment postcard
14. ☒ Certificate of Mailing
- ☐ First Class                      ☒ Express Mail (Specify Label No.): EL550340460US

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09-11-00

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9283 U.S. PTO

# UTILITY PATENT APPLICATION TRANSMITTAL (Large Entity)

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## Accompanying Application Parts (Continued)

15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
16. ☒ Additional Enclosures (please identify below):

PTO-Form 2038--USPTO Credit Card Payment Form charging the amount of \$.00 for filing fee and Assignment recordation fee

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## Fee Calculation and Transmittal

### CLAIMS AS FILED

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	15	- 20 =	0	x \$18.00	\$0.00
Indep. Claims	4	- 3 =	1	x \$78.00	\$78.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
BASIC FEE					\$690.00
OTHER FEE (specify purpose) Assignment Recordation Fee					\$40.00
TOTAL FILING FEE					\$808.00

- ☒ A check in the amount of \$808.00 to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. 23-3178 as described below. A duplicate copy of this sheet is enclosed.
- ☐ Charge the amount of as filing fee.
- ☒ Credit any overpayment.
- ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
- ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

  
Signature

Kevin K. Johanson  
Registration No. 38,506



022913

Dated: September 8, 2000

cc:

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**CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10)**

Applicant(s): Morley et al.

Docket No.

11960.3112

Serial No.

Not Yet Assigned

Filing Date

September 8, 2000

Examiner

Not Yet Assigned

Group Art Unit

Not Yet Assigned

Invention: CONNECTOR SCHEME TO ALLOW PHYSICAL ORIENTATION OF A COMPUTER PERIPHERAL

JC841 U.S. PTO  
09/658108  
09/08/00I hereby certify that this Utility Patent Application (including the items listed below)

(Identify type of correspondence)

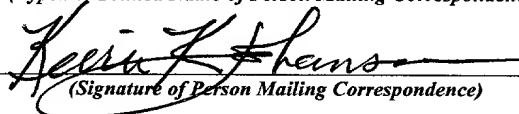
is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under  
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20231-0001 on September 8, 2000

(Date)

Kevin K. Johanson

(Typed or Printed Name of Person Mailing Correspondence)



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Note: Each paper must have its own certificate of mailing.

Transmitted: Utility Patent Application (31 pgs.)  
Utility Patent Application Transmittal Letter (3 pgs.)  
Formal Drawings (4 sheets)  
Declaration, Power of Attorney, and Petition (4 pgs.)  
Assignment including Recordation Form Cover Sheet (5 pgs.)  
United States Patent and Trademark Credit Card Payment Form  
charging the amount of \$808 (1 pg.)  
Certificate of Mailing by Express Mail Label No. EL550340460US  
Postcard

## CONNECTOR SCHEME TO ALLOW PHYSICAL ORIENTATION OF A COMPUTER PERIPHERAL

## **BACKGROUND OF THE INVENTION**

### **Field of the Invention**

The present invention relates generally to adaptor structures selectively coupled to an interface on a digital device. More specifically, the present invention applies to an adaptor for directly coupling to a peripheral device and selectively coupling to a digital device regardless of the digital device's interface orientation or position.

### **Description of Related Art**

Adding an old-fashioned peripheral device to a digital device, such as a personal computer, can be a very difficult process. The user is often required not only to have considerable computer expertise, but also a certain amount of providence. First, the user must determine which port from a vast assortment of possibilities on the digital device to use. Then in most cases, the user must open the digital device to install a peripheral device controller card and set various DIP switches. Finally, the user must properly configure the touchy IRQ settings, not to mention other machine specific alterations. This process was almost enough to deter even the most resourceful users from even thinking about adding a new peripheral to their digital device.

The industry recognizes that standardization of peripheral device interfaces, among other things, greatly increases the demand for peripheral devices and as such the industry has developed a wide variety of standard peripheral device interfaces. The most common of these peripheral device interfaces are serial ports and parallel ports. Unfortunately, as computer processor speeds and user performance expectations continue to increase, it is apparent that the older and traditional peripheral device interfaces no longer communicate at fast enough rates for the modern peripherals.

1 In view of the configuration hassles previously associated with customized  
2 peripheral device interfaces and the speed and bandwidth limitations of available  
3 standardized peripheral device interfaces, several manufacturers collaborated to develop  
4 the Universal Serial Bus (USB) specification. USB connects computers and peripherals.  
5 USB devices provide a user with an easy, compact device that can connect to most digital  
6 devices. The speed ranges of the USB peripheral-to-PC connection are 480 Mbits/s on  
7 USB 2.0, 12 Mbits/s on USB 1.1, and 1.5 Mbits/s on USB 1.0. The higher bandwidth of  
8 USB peripheral device interfaces allow for support of applications, such as wireless  
9 networking, digital image creation, and web publishing.

10 Now, many electronic devices being manufactured, especially those requiring an  
11 instant, no-hassle, high-speed connection are adapted to accommodate these standards.  
12 Digital photography, digital imaging, PC-telephony, and video conferencing, in  
13 particular, are increasingly popular for both business and personal applications due in  
14 part to the development of USB compatible peripheral devices designed to increase the  
15 functionality of the computers in these areas. As an example, USB devices are commonly  
16 used to provide added features and/or functions. For instance, USB allows quick  
17 connections for a new digital joystick, a scanner, a set of digital speakers, a digital  
18 camera, a PC telephone to the computer, or other USB device supplying add-on  
19 functionality.

20 The USB specification also developed and promulgated standards for the physical  
21 design, dimensions, and electrical interface of peripheral devices using a keyed connector  
22 protocol. Specifically, the USB standard identifies two primary connector types: Series  
23 A and B. These connector types correspond to physical dimension restrictions that insure  
24 proper end user connectivity. Series "A" connectors are the principle means of

1 connecting USB devices directly to a host computer system or to the downstream port of  
2 a hub. The series "A" receptacles provide a downstream output interface from the USB  
3 host system or hub. The series "A" plugs electrically and mechanically couple with the  
4 series "A" receptacles such that the plugs are always oriented upstream towards the host  
5 system. The series "B" connectors are used as one available means of connecting a USB  
6 cable to the peripheral device and allowing peripheral device vendors to provide the user  
7 with a standard detachable cable for use with their device. As such the series "B" plug is  
8 always oriented downstream towards the USB device and series "B" receptacle.  
9 Unfortunately, both types of connectors have a fixed orientation with respect to the  
10 receptacles for receiving the plugs on the host and peripheral device.

11 Currently, USB series "A" receptacles can be found on current notebook  
12 computers in all of the four possible 90-degree orientations. One common problem  
13 presently faced by many USB peripheral devices is how to attach a peripheral, which  
14 requires a specific orientation, via a USB plug to a USB receptacle in each of the possible  
15 orientations without using multiple joints or a cable to reorient the peripheral. Other  
16 industry attempts to solve this problem require either an attached cable or multiple joints.  
17 Unfortunately, the attached cable solution does not allow direct connection to the  
18 computer, as a finite length of cable is necessary before it can reorient the peripheral, and  
19 thus the cable retains a residual amount of rotational tension. The use of multiple joints  
20 is also undesirable as these connections are expensive and not reliable. It would be an  
21 advance over the present state of the art to develop an adaptor that maintained all of the  
22 USB functionality, but improved the ability of the adaptor to reorient an interface for the  
23 attached peripheral thereby increasing the functionality and control of the attached  
24 peripheral.



1 Exemplary USB peripheral devices that require specific orientation include short-  
2 range wireless devices and USB antenna structures. Antenna structures, predominantly  
3 used for wireless communication, efficiently transmit and receive electromagnetic energy  
4 in the form of radio waves. Antenna structures are used whenever it is impractical, or  
5 impossible to use a physical connection, such as a transmission line or wave-guide. In  
6 order to get the best performance out of a wireless antenna, the antenna must not be  
7 obstructed by anything within its path of radiation. Conventional antennas used to  
8 connect a digital device to a wireless communication system or cellular telephone are  
9 typically placed externally from the digital device because of the noise, interference,  
10 obstruction and shielding caused by the various components of the digital device. In  
11 particular, conventional antennas do not function correctly if they are obstructed or  
12 shielded by the housing or other structures of the digital device. As such USB antenna  
13 structures, if properly oriented, can avoid many of the aforementioned problems.  
14 Additionally, USB antennas are externally located, typically have high bandwidth  
15 capabilities, and are selectively detachable from the USB receptacle. However, the use of  
16 multiple joints or a cable hinders the performance of the USB antenna by reducing the  
17 available power for radiation. The use of easy attachment and configuration USB  
18 antennas are good for the progress and integration of wireless communication.

19 One short-range wireless standard that is in the process of being embraced is  
20 preliminarily known by the name of "Bluetooth." Bluetooth, which is only one example  
21 of a short-range wireless standard, is actually a combination of specialized computer  
22 chips and software. Bluetooth is the codename for a technology specification for small  
23 form factor, low-cost, short-range radio links between mobile PDAs, PCs, mobile phones  
24 and other portable devices. Bluetooth, for example, also offers speedy transmission of up

1 to one megabyte per second, over 17 times as fast as a typical modem. One of the present  
2 Bluetooth specification restrictions is to limit the transmission range so that the resulting  
3 radiation pattern typically does not exceed 10 meters.

4 The IEEE 802.11 RF wireless standards: 802.11 HR, 802.11b, and 802.11 @ 5  
5 GHz standards are also very popular. Other exemplary short-range wireless standards  
6 potentially useful with USB antenna structures include: HiperLan, HiperLan II, HomeRF,  
7 SWAP, OpenAir, and other wireless protocols. These wireless standards enable users to  
8 connect a wide range of computing and telecommunications devices easily and simply,  
9 without the need to buy, carry, or connect cables. They deliver opportunities for rapid ad  
10 hoc connections, and the possibility of automatic, unconscious, connections between  
11 devices. They may virtually eliminate the need to purchase additional or proprietary  
12 cabling to connect individual devices. Because these standards can be used for a variety  
13 of purposes, they will also potentially replace multiple cable connections via a single  
14 radio link. If properly oriented USB antenna structures can greatly improve the  
15 development and integration of these standards into a home computer thereby facilitating  
16 a wireless computing environment.

## SUMMARY OF THE INVENTION

The present invention creates a communication quality connection across an interface between a digital device and a peripheral device, while enabling the flexible orientation of the peripheral device relative to the interface. These qualities are primarily accomplished through an adaptor, which includes two connectors one for coupling to the digital device and a second connector for coupling to the peripheral device. The adaptor electrically extends the interface signals to the second connector, which facilitates peripheral orientation.

The present invention has been developed in response to the current state of the art, and in particular, in response to these and other problems and needs that have not been fully or completely solved by currently available connectors for peripheral devices. Thus, it is an overall object of the present invention to provide a reliable reorienting connection between the attached peripheral device and the digital device via a custom adaptor. This can be accomplished by having the adaptor attached to the peripheral device via a custom connector assembly, which can connect to the peripheral in any of the different orientations. The peripheral connector on the adaptor is wired to insure proper connection of the signals in all possible orientations. In one embodiment, a USB series "A" plug delivers the 4 USB signals to the custom connector assembly, which facilitates connection between the adaptor and the peripheral device in four different orientations. An example of the pin configuration used with this connector assembly is shown in Figure 3.

Accordingly, one aspect of the apparatus is to provide a simple, reliable, and low cost solution to directly connecting the peripheral to the USB connector receptacle while

1 maintaining a desired peripheral orientation. Other solutions, which may be available,  
2 compromise one of these elements.

3 Another aspect of the apparatus is that the adaptor provides a custom peripheral  
4 connector, which can connect to the peripheral device in different orientations without  
5 changing the peripheral connector. The custom peripheral connector on the adaptor is  
6 electrically wired in such a way so as to insure proper connection of the signals in all  
7 possible peripheral device orientations.

8 Yet another aspect of the apparatus is to create a USB compatible short-range  
9 wireless (e.g. "Bluetooth", 802.11 RF, etc.) interface device that properly orients the  
10 antenna and maintains all of the traditional wireless functionality. The USB connection  
11 improves the connection speed between the peripheral and host computer, thereby  
12 improving the overall wireless connections available.

13 Additional objects and advantages of the invention will be set forth in the  
14 description which follows, and in part will be obvious from the description, or may be  
15 learned by the practice of the invention. The objects and advantages of the invention may  
16 be realized and obtained by means of the instruments and combinations particularly  
17 pointed out in the appended claims. These and other objects and features of the present  
18 invention will become more fully apparent from the following description and appended  
19 claims, or may be learned by the practice of the invention as set forth hereinafter.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In order that the manner in which the above recited and other advantages and objects of the invention are obtained, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments thereof, which are illustrated in the appended drawings. Understanding that these drawing depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

Figure 1 illustrates an exemplary system that provides a suitable operating environment for the present invention;

Figure 2 is a perspective view of a custom connector interface for rigidly affixing an adaptor and peripheral in one of four orientations, the coupled combination for use with a digital device as illustrated in Figure 1;

Figures 3A-3E illustrate various custom connector pin assignment interfaces for use with the custom connector interfaces as illustrated in Figure 2;

Figure 4 is a perspective view of a circular contact connector interface for rigidly affixing a rotating adaptor and peripheral together;

Figure 5 illustrates a custom connector contact assignment interface for use with the circular contact connector interface as illustrated in Figure 4; and

Figure 6 illustrates a side view of a custom connector for use with a four contact connector.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Figure 1 and the following discussion are intended to provide a brief, general description of a suitable computing environment in which the invention may be implemented. Those skilled in the art will appreciate that the invention may be practiced with many types of computer system configurations, including personal computers, hand-held devices, multi-processor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, Personal Digital Assistants, digital cameras, and the like.

Reference is first made to Figure 1, an exemplary laptop computer system or environment in which the present invention may be utilized or implemented. Figure 1 is intended to be illustrative of potential systems that may utilize the present invention and is not to be construed as limiting. The system of Figure 1 illustrates a portable computer 10 having a pair of universal serial bus (USB) series "A" connector receptacles 12 that are each configured to receive a USB series "A" plug 22. The USB receptacles having a rectangular shield shell that aligns with the shield shell of the USB plug so that the receptacle VBUS 14, D- 16, D+ 18, and GND 20 signal contacts interface with the plug VBUS 15, D- 17, D+ 19, and GND 21 signal contacts. These signals are replicated in adaptor 24 to generate a 16-pin custom adaptor interface 26 (described in more detail under Figure 3). The adaptor interface electrically and mechanically couples with 16-pin peripheral interface 28 on peripheral device 30.

The connector receptacle 12 preferably defines a cavity that receives a portion of the connector plug 22. The receptacle 12 is preferably shaped so as to preclude insertion of electrically incompatible connector plugs. This feature prevents the inadvertent attachment of plugs that contain electrical signals that could damage electronics within

1 the attached peripheral device. This feature also precludes insertion of inverted  
2 connector plugs. The connector receptacle 12 further comprising a retention mechanism,  
3 and the force imposed thereby, provides tactile and audible feedback to notify the user  
4 when the connector plug 22 has been securely received within connector receptacle 12.  
5 The connector receptacle 12 and retention mechanism is fashioned to mechanically fasten  
6 the connector plug 22 in the proper place. The USB connector receptacles are generally  
7 configured to removably receive a USB connector plug that is connected to one end of a  
8 USB cable. There are three supported USB adaptor assemblies for interfacing with a  
9 USB connector receptacle: a standard detached cable, a high or full speed captive cable,  
10 and a low speed captive cable. In one preferred embodiment, adaptor assembly 24 is  
11 either a high, full, or low speed series "A" plug captive cable configuration without a  
12 cable. The term "captive cable" means that the adaptor 24 is terminated on one end by a  
13 series "A" plug and on the opposite end by a vendor specific connection means  
14 (hardwired or custom detachable) for use with the peripheral device. One difference  
15 between the various cable assemblies and the present invention is the rigid coupling of  
16 the peripheral via the adaptor to the USB receptacle. By eliminating the cable between  
17 the plugs, the adaptor eliminates the residual rotational tension present in operationally  
18 reoriented cable assemblies. Furthermore, the reliability of the adaptor increases over  
19 cable assemblies that may crack and wear over time.

20 In contrast, the custom adaptor interface 26 is preferably shaped so as to allow  
21 insertion of an inverted peripheral interface 28, as well as any other approved peripheral  
22 orientation. In one configuration, the peripheral interface is allowed to continuous  
23 reorient itself along a series of circular contacts to optimally arrange the attached  
24 peripheral. The custom adaptor interface does, due to its customized design, inhibit the

1 insertion of electrically incompatible connector plugs. This feature hampers the  
2 inadvertent attachment of plugs that contain electrical signals that could damage  
3 electronics within the computer. The custom adaptor interface 26 further comprises a  
4 retention mechanism, and the insertion force imposed thereby, provides tactile and  
5 audible feedback to notify the user when the peripheral interface 28 has been securely  
6 received within adaptor interface 26. The adaptor interface 26 and retention mechanism  
7 are fashioned to mechanically fasten the peripheral interface 28 in the proper place.  
8 While the custom adaptor interface 26 also selectively receives a portion of the peripheral  
9 interface 28, the extraction force of the adaptor interface and the peripheral interface  
10 exceeds the extraction force and insertion force of the connector plug and receptacle. In  
11 one configuration, the USB connector plug and receptacle exhibit an insertion force of 35  
12 Newtons maximum at a maximum rate of 12.5 mm per minute and an extraction force of  
13 10 Newtons minimum at a maximum rate of 12.5 mm per minute. Exceeding the  
14 extraction force of the plug and receptacle coupling insures that the adaptor interface and  
15 peripheral interface coupling will remain connected when the connector plug is removed  
16 from the connector receptacle on the computer. In one configuration, the extraction force  
17 of the adaptor interface and peripheral interface coupling is less than the cable pull-out  
18 performance of the USB connector, such that the application of a steady state axial load  
19 of 40 Newtons for one minute will result in a separation of peripheral interface from  
20 adaptor interface. In another configuration, the peripheral and adaptor interface coupling  
21 extraction force exceeds even the standard USB cable pullout specification to insure that  
22 the peripheral does not separate itself from the adaptor once it is properly oriented.

23 The adaptor 24 couples to peripheral device 30 illustrated as a short-range  
24 wireless device. The adaptor 24 may also couple with devices such as a scanner, digital



1 camera, modem, a network hub or interface card, a wireless communication card  
2 including antenna, an external device controller card, or any other USB compatible  
3 peripheral device. The USB plug 22 of adaptor 24 is configured to detachably connect  
4 with a high-speed USB connector receptacle 12. The transfer rates of the USB  
5 peripheral-to-PC connections vary according to the USB version employed by the  
6 peripheral device. Presently there are three existing USB data transfer rates: High speed  
7 (480 Mbits/s using USB 2.0 or better), Full speed (12 Mbits/s using USB 1.1), and Low  
8 speed (1.5 Mbits/s using USB 1.0 or less). High and Full speeds require a shielded cable  
9 with two power conductors and a twisted pair of signal conductors. The higher  
10 bandwidth of USB peripheral device interfaces when compared to tradition serial and  
11 parallel port transfers allow for support of applications, such as wireless networking,  
12 digital image creation, and web publishing.

13 Inserting USB plug 22 in USB receptacle 12 permits adaptor 24 to be in electrical  
14 and physical communication with computer 10. In one preferred configuration,  
15 receptacle 12, plug 22, and adaptor 24 are USB compliant. As such, the USB connectors  
16 are designed to be hot plugged. Series "A" plugs mate with series "A" receptacles. The  
17 series "A" plug always is oriented toward the host system. Electrically, series "A"  
18 receptacles function as outputs from host systems and/or hubs. The adaptor 24  
19 transfigures the four USB contacts of the standard USB connector, consisting of two  
20 power conductors and two signal conductors, into one of the custom connector pin  
21 assignments illustrated in Figures 3, 5, and 6. Ground contact 21 provides a common  
22 ground reference between the upstream and downstream ports and is replicated in adaptor  
23 24 as contacts 42, 42', 42'', and 42''' in Figure 3a. The voltage drop across the ground  
24 lead limits the maximum cable length. The VBUS 15 contact is replicated as contacts 36,

1 36', 36'', and 36''' in Figure 3a, it also provides power to the connected peripheral  
2 device 30. To satisfy the USB high/full speed captive cable assembly requirements, the  
3 adaptor should satisfy the following electrical requirements: First, the adaptor must be  
4 terminated on one end with a series "A" plug and on the opposite end with a vendor  
5 specific or custom peripheral interface. If the vendor specific interconnect is to be hot  
6 plugged, it must meet the same performance requirement as the USB series "A" and "B"  
7 connectors. Second, the adaptor must be rated for high speed and full speed. Third, the  
8 adaptor impedance must match the impedance of the high speed and full speed drivers.  
9 Fourth, the drivers are characterized to drive specific adaptor impedance. The USB  
10 specification revision 2.0 § 7.1.1 provides adaptor impedance details. The maximum  
11 allowable adaptor replication breadth and length is determined by the signal pair  
12 attenuation and propagation delay. Fifth, differences in propagation delay between the  
13 two replicated signal conductors 17 and 19 must be minimized. Sixth, the ground contact  
14 21 provides a common reference between upstream and down stream ports. The voltage  
15 drop across the ground lead limits the maximum adaptor length. The minimum wire  
16 gauge used in the adaptor is calculated using the worst-case current consumption. And,  
17 finally, the VBUS contact 15 provides power to the peripheral device via replicated  
18 contacts. The minimum wire gauge is peripheral specific, but is most preferably the same  
19 as the ground contact.

20 In one configuration of the present invention, the raw materials used in the  
21 fabrication of the USB to custom adaptor 24 must be of such quality that the fabricated  
22 adaptor is capable of moving or exceeding the mechanical and electrical performance  
23 criteria of the most current USB specification revision and all input federal domestic and  
24

1 international safety/testing agency requirements; such as, UL, CSA, BSA, NEC, etc., for  
2 electronic signaling and power distribution cables in this category.

3 Although adaptor 24 includes plug 22, which is illustrated as a USB Series "A"  
4 connector plug, the adaptor may also be any connector type, including but not limited to,  
5 propriety based multiple pin connectors, 15-pin connectors, RJ type connectors, or  
6 coaxial cable connectors. The terms connector receptacle, miniature modular jack,  
7 dongle connectors, physical/electrical media connector, fixed jack, AC820 compliant  
8 jack, XJACK® connectors or sockets, alligator jack, and the like, connote a media  
9 connector that may have qualities such as those connectors having physical attributes  
10 described in FCC Part 68, Subpart F. Specific terms such as RJ-type, RJ-11, RJ-45, 6-pin  
11 miniature modular plug, 8-pin miniature modular plug, USB series "A" and "B"  
12 connectors, and similar terminology are all references to specific exemplary  
13 physical/electrical media connectors falling within the broader parameters of the term  
14 media connectors and are cited by way of example and should not be used to limit the  
15 scope of the present invention to specific connectors. This is particularly true as many of  
16 the aforementioned connector sockets do not presently provide variable orientation based  
17 coupling as used by the present invention, and the custom adaptor to peripheral interface  
18 would require modifications to appropriately practice the invention. Therefore, the  
19 connection type is not as important as the ability to make a connection between a digital  
20 device and an adaptor, replicate the signals from the digital device and pass them through  
21 a custom peripheral interface on the adaptor to a peripheral device. For example, if the  
22 digital device is coupled using RJ-type connectors to the adaptor then the RJ signals  
23 should be replicated and extended to the custom peripheral interface. Connector signals  
24 may need to be reoriented at the adaptor before coupling with the peripheral device for a

1 variety of reasons including improved antenna reception, easier detachment, or operable  
2 positioning.

3 Figure 2 is a perspective view of a custom connector interface for rigidly affixing  
4 an adaptor and peripheral in one of four orientations. Specifically, Figure 2 illustrates the  
5 four different orientations possible for custom adaptor 24 with respect to a USB  
6 receptacle and peripheral device 30. The four USB contacts are replicated into four  
7 duplicate contacts within adaptor interface 26. Each orientation relies on different contact  
8 pins in adaptor interface 26 to actively communicate with peripheral interface 28.  
9 Groups of active contacts are illustrated in Figure 3 that correspond to the relative  
10 positional orientations of the adaptor interface as illustrated in Figure 2. The various  
11 orientations are used to properly orient antenna 32 in the vertical position on peripheral  
12 30 relative to the orientation of the USB receptacle. This solution provides a simple,  
13 reliable, and low cost solution to directly connect the peripheral to the USB connector  
14 receptacle. Other solutions compromise one of these elements.

15 Custom adaptor 24 comprises a USB connector plug 22 and a custom adaptor  
16 interface 26 (described in more detail in Figure 3). The adaptor interface 26 may employ  
17 various contact configurations that allow for the peripheral 30 to be properly oriented  
18 relative to the USB plug 22. Exemplary contact configurations are illustrated in Figures  
19 3 and 5. The adaptor interface illustrated in Figure 2 is compatible with the 16-pin  
20 custom contact assignment matrix illustrated in Figure 3. In this manner the custom  
21 adaptor may be rotated in any one of the four different possible wire orientations so that  
22 the peripheral antenna 32 may be attached to the adaptor in a vertical fashion. In this  
23 configuration it is preferred that the custom adaptor 24 only be used with one peripheral  
24 device and remain oriented specifically for the individual laptop configuration. In other

1 words, it is anticipated that this adaptor will only need to be set once or at least  
2 infrequently as peripheral devices are generally not widely shared between different  
3 computers. As such, the connection between the peripheral and the custom adaptor is a  
4 strong mechanical connection such that if one pulls on the peripheral the USB connector  
5 will be the first connection to break and the custom adaptor will remain attached to the  
6 peripheral.

7 For illustrative purposes only, peripheral device 30 is a USB short-range wireless  
8 module, such as a bluetooth radio, rigidly connected to the USB connector receptacle via  
9 adaptor 24. Where the adaptor is designed to operably orient antenna 32 in an upward  
10 fashion. In one configuration, peripheral device 30 is a transceiver module electrically  
11 connected to the custom peripheral interface 28 and to a short-range wireless antenna 32.

12 Bluetooth, which is only one example of a short-range wireless standard, is  
13 actually a combination of specialized computer chips and software that enable small-form  
14 factor, low-cost, short-range radio links between laptops, phones, and other portable  
15 digital devices. By way of example, peripheral 30 includes all of the necessary hardware  
16 components to create the radio link. Specifically, the peripheral bluetooth module  
17 incorporates a bluetooth stack, a link manager, a RF baseband radio, and a power  
18 amplifier to generate the bluetooth signals. The bluetooth signals are then transmitted to  
19 short-range wireless antenna 32. The short-range wireless antenna transceiving the  
20 bluetooth signals, with the desired orientation for the short-range wireless antenna being  
21 upwards. The standard transfer rate for high-speed bluetooth connections is up to one  
22 megabyte per second, over 17 times as fast as a typical modem.

23 Rather than designing the short-range wireless peripheral 30 to have multiple  
24 joints or to use a cable assembly to supply reorientation, the illustrated embodiment of

1 the adaptor and peripheral are configured to accommodate all four USB orientations. As  
2 such, the user could determine how the USB port on their laptop was oriented and  
3 appropriately connect the peripheral 30 and antenna 32. Assuming that the connected  
4 USB peripheral is a single user peripheral, the adaptor interface and peripheral interface  
5 could be lastingly coupled in the appropriate orientation relative to the users USB  
6 connector receptacle.

7 Figure 3a illustrates a 16-pin custom contact assignment matrix for use with the  
8 peripheral interface 28 as illustrated in Figure 2. Specifically, the 16-pin custom contact  
9 assignment matrix illustrates how the USB input contacts 15, 17, 19, and 21 are  
10 replicated and connected to respective contacts A 36, B 38, C 40, and D 42 in the contact  
11 assignment matrix. The adaptor interface on the module is wired in such a way so as to  
12 ensure the proper connection of the four USB signal lines in each of the possible  
13 orientations of the adaptor interface. The active contacts for each orientation are grouped  
14 together. For example, if adaptor 24 is properly oriented then adaptor interface 26  
15 includes the active contacts 36, 38, 40, and 42. When the adaptor is rotated 90-degrees  
16 the active adaptor interface is 26' includes contacts 36', 38', 40', and 42'. Yet another  
17 90-degree rotation results in adaptor interface 26'' being active with contacts 36'', 38'',  
18 40'', and 42''. Finally, a last 90-degree rotation results in adaptor interface 26''' being  
19 active using contacts 36''', 38''', 40''', and 42''' to interface with the peripheral  
20 interface 28.

21 With reference to Figure 3b, an exemplary 13-pin custom contact assignment  
22 matrix used to couple the adaptor with a similar 13-socket peripheral interface. The  
23 sockets are configured to receive the pins and electrically and mechanically couple the  
24 peripheral to the USB orientation adaptor. Specifically, the 13-pin custom contact

1 assignment matrix illustrates how the USB input contacts 15, 17, 19, and 21 are  
2 replicated and connected to contacts A 36, B 38, C 40, and D 42 respectively in the  
3 contact assignment matrix. This configuration utilizes a central contact D 42 in all four  
4 orientations, thereby minimizing the cost and degree of difficulty associated with  
5 construction of the adaptor. As with the previous interface, the interface illustrated in  
6 Figure 3b is wired in such a way so as to ensure the proper connection of the four USB  
7 signal lines in each of the possible orientations of the adaptor interface. The active  
8 contacts for each orientation are grouped together. For example, if adaptor 24 is properly  
9 oriented then adaptor interface 26 includes the active contacts 36, 38, 40, and 42. When  
10 the adaptor is rotated 90-degrees the active adaptor interface is 26' includes contacts 36',  
11 38', 40', and 42'. In this embodiment, contact point D42 is reused with each orientation.  
12 Yet another 90-degree rotation results in adaptor interface 26'' being active with contacts  
13 36'', 38'', 40'', and 42''. Finally, a last 90-degree rotation results in adaptor interface  
14 26''' being active using contacts 36''', 38''', 40''', and 42''' to interface with the  
15 peripheral interface 28.

16 With reference to Figure 3c, another exemplary 13-pin custom contact assignment  
17 matrix used to couple the USB adaptor with a similar 13-socket peripheral interface. As  
18 with the previous interfaces, the interface illustrated in Figure 3c is wired in such a way  
19 so as to ensure the proper connection of the four USB signal lines in each of the possible  
20 orientations of the adaptor interface. In get and other variation to this embodiment, this  
21 interface utilizes a large central contact D 42 that may be used as a guidepost to assist the  
22 user in coupling the adaptor and peripheral in each of the orientations. This guidepost is  
23 larger than the other contacts, making the insertion of the plug into the socket easier. The  
24 rounded nature of the guidepost allows for insertion assistance without committing the

1 coupling to one particular orientation. In an alternative configuration the central  
2 guidepost may be shaped to preclude insertion except in one of the specified orientations.  
3 For example, a square guidepost would limit insertion to one of four preferred  
4 orientations, while a hexagon guidepost would limit insertion to one of six preferred  
5 orientations.

6 With reference to Figure 3d, another exemplary 13-pin custom contact assignment  
7 matrix used to couple the adaptor with a similar 13-socket peripheral interface. This  
8 interface utilizes a central contact surrounded by three sets of concentric contact rings  
9 comprising multiple contact points. The contact points on each concentric contact ring  
10 may be arranged according to the desired orientations of the plug and socket. Figure 3d  
11 illustrates four possible orientations using USB contact groupings 26, 26', 26'', and 26'''  
12 where the center contact point D 42 is reused with each orientation. Also, the positional  
13 location of each contact A 36, B 38, C 40, and D 42 may be interchanged with other  
14 positions without departing from the scope of the invention. As with the previous  
15 interface, the interface illustrated in Figure 3d is wired in such a way so as to ensure the  
16 proper connection of the four USB signal lines in each of the possible orientations of the  
17 adaptor interface.

18 Figure 3e provides a perspective view of the pin or socket configuration  
19 illustrated in 3d. One advantage of this configuration is that it minimizes the  
20 manufacturing costs and the size of the custom adaptor. For example, each contact ring  
21 may be manufactured using a single stamp and the adaptor may be configured so that the  
22 connections do not have to cross each other, where the contacts could short. The metal  
23 stamp would resemble a hub with spokes, where each spoke may be bent accordingly to  
24 become the contact points for the USB and custom interface sides. This physical



1 orientation is also advantageous in that the separation between rings need only be radially  
2 constant allowing the overall size of the plug and socket to be smaller than in many other  
3 illustrated configurations. In an alternative configuration, the concentric arrangement  
4 could also utilize a center guidepost to direct and assist the plug and socket coupling.

5 The contact configuration shown in Figures 3, 5, and 6 only examples of  
6 acceptable adaptor interfaces. As is known to one skilled in the art, this particular contact  
7 orientation is not the only configuration that might be used. In fact, any orientation,  
8 which allows the peripheral to be rotated to the four different orientations, would be  
9 acceptable. Furthermore, multiple orientations are possible by expanding the adaptor and  
10 peripheral interface to include a section of contacts for each desired orientation. Also the  
11 number of contacts may be increased. While the preferred embodiment utilizes the USB  
12 standard with four contacts, other standards may require more contacts. Yet another  
13 configuration realizes the ability to generate a suitable orienting connector that shares a  
14 centralized contact in every possible orientation. Other similar configurations are  
15 considered to be within the scope of the present invention.

16 Figure 4 is a perspective view of a rotating adaptor using a circular contact  
17 coupling for rigidly affixing a digital device and peripheral together. The circular contact  
18 coupling 26 is useful for interfaces where the desired orientation of the peripheral is  
19 unspecified or the peripheral device needs to continuously reorient relative to the digital  
20 device. The illustrated rotating adaptor 25 includes a USB series "A" plug 22 electrically  
21 coupled to a USB series "B" plug 44 via circular contact coupling 26. The circular  
22 coupling on the adaptor between the digital device and the peripheral electrically  
23 connects the devices without limiting the mechanical coupling to a specific orientation.  
24 A specific circular contact coupling is illustrated and described in more detail in Figure 5.

1 The USB series "A" plug contacts 15, 17, 19, and 21 (Figure 1) are electrically  
2 coupled to USB series "B" plug contacts 45, 47, 49, and 51. The series "B" plug is  
3 adapted to mechanically and electrically couple with series "B" receptacle 46. When  
4 properly coupled contacts 45, 47, 49, and 51 of the plug electrically couple with contacts  
5 55, 57, 59, and 61 of the receptacle according to USB specifications. An alternative  
6 configuration mechanically couples the series "B" plug and receptacle in a manner that  
7 requires a greater extraction force to break the coupling than is required by the coupling  
8 between the series "A" plug and receptacle. This ensures that the rotating adaptor will  
9 remain attached to the peripheral upon removal of the adaptor from the attached digital  
10 device. Yet another configuration uses custom couplings between the rotating adaptor  
11 and the peripheral or the digital device that still allows for the rotational reorientation  
12 between the peripheral and the digital device via the adaptor.

13 Figure 5 illustrates a custom connector contact assignment interface for use with  
14 the circular contact connector interface as illustrated in Figure 4. The USB signals are  
15 extended from the plug to the adaptor interface such that the outer contact ring 66 is  
16 electrically connected to VBUS signal 15. D- signal 17 is electrically connected to  
17 contact ring 68. D+ signal 19 is electrically connected to contact ring 70. Finally, GND  
18 signal 21 from the USB connector plug is electrically connected to the center contact 72.  
19 The circular contact coupling 26 may use a variety of contact means to transfer the  
20 signals to the output lines on the series "B" plug 45, 47, 49, and 51. For example, the  
21 rotating adaptor may use capacitive, inductive, or direct connections, such as wire  
22 brushes, to engage each contact ring and relay the signals to the peripheral device via the  
23 plug regardless of the orientation.  
24

1 Variations of the circular contact connector interface include variable circular  
2 contacts in which the electrical contact rings 66, 68, and 70 are only electrically engaged  
3 at predetermined positions relative to peripheral device orientations and disengaged or  
4 disabled between the predetermined positions. Another configuration uses a continuous  
5 electrical connection with slotted mechanical orientations so that the circular contact  
6 coupling clicks into each of the mechanical orientations.

7 One of these concentric variations is illustrated in Figure 6. Each contact ring A,  
8 B, C, and D are separated via insulated sections between each contact. The contact rings  
9 are concentric around an axis. The contact rings may have smooth or staggered radii.  
10 Staggered radii allow for simultaneous contact by the socket contacts 76, 78, 80, and 82.  
11 As illustrated in Figure 6, the socket contacts are also oriented so that only socket contact  
12 82 can electrically couple to contact tip D. Each of the contact points may be  
13 interchanged, but the USB contact can only be made if the plug is fully inserted in the  
14 socket. Furthermore, the diameters of each contact may vary such as in an increasing  
15 diameter at the proximal end of the series of contact sockets.

16 The present invention may be embodied in other specific forms without departing  
17 from its spirit or essential characteristics. The described embodiments are to be  
18 considered in all respects only as illustrative and not restrictive. The scope of the  
19 invention is, therefore, indicated by the appended claims rather than by the foregoing  
20 description. All changes that come within the meaning and range of equivalency of the  
21 claims are to be embraced within their scope.

22 What is claimed and desired to be secured by United States Letters Patent is:  
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1  
2 1. An adaptor that enables re-orientation of a peripheral adaptor comprising:  
3 a Universal Serial Bus (USB) series "A" plug with four contacts;  
4 a peripheral interface enabled to allow the attachment of the peripheral in  
5 different orientations, the peripheral interface being fixably coupled and  
6 electrically connected to the USB plug such that the four contacts are electrically  
7 extended to the peripheral interface for access by the peripheral.

8  
9 2. The adaptor as recited in claim 1, wherein the different orientations are  
10 one of four possible orientations and wherein the peripheral interface further comprises a  
11 four by four matrix of contacts arranged so that the peripheral may use the same four  
12 contact connector configuration in all four of the possible orientations, thereby enabling  
13 the same peripheral connector to be used regardless of the desired orientation.

14 3. The adaptor as recited in claim 1, wherein the peripheral interface further  
15 comprises a circular contact joint arranged so that the peripheral may use the extended  
16 four contacts in all possible orientations, thereby enabling the peripheral connector to  
17 remain electrically engaged with the extended contacts regardless of the actual  
18 orientation.  
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2 4. The adaptor as recited in claim 1, wherein the peripheral interface has an  
3 extraction force in excess of the extraction force associated with the USB plug so that the  
4 adaptor stays attached to the peripheral when the USB plug is extracted from a USB  
5 series "A" receptacle.

6  
7 5. The adaptor as recited in claim 4, wherein the peripheral interface has an  
8 extraction force greater than 10 Newtons at an extraction rate of 12.5 mm per minute.

9  
10 6. The adaptor as recited in claim 4, wherein the peripheral interface has an  
11 extraction force greater than 40 Newtons steady state axial load for one minute.

12 7. The adaptor as recited in claim 1, wherein the peripheral is configurable as  
13 a wireless device enabling short-range wireless communication, the peripheral further  
14 comprising an antenna oriented in an upward direction.  
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2 8. The adaptor as recited in claim 1, the peripheral further comprises:  
3 a wireless transceiver module electrically connected to the peripheral  
4 interface that transceives signals to the USB plug; and  
5 a wireless antenna electrically connected to the wireless transceiver  
6 module for transceiving signals generated by the wireless transceiver module.  
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2 9. An adaptor system for rotationally re-orienting a peripheral device fixably  
3 connected to a digital device, the adaptor system comprising:

4 a Universal Serial Bus (USB) series "A" plug with four signal wires;  
5 a custom adaptor interface for electrically extending the signal wires from  
6 the plug to the peripheral device;  
7 a peripheral with desired orientation specific parameters; and  
8 a custom peripheral interface for electrically coupling with the adaptor  
9 interface such that the extraction force exceeds the extraction force of a USB  
10 series "A" plug and receptacle.

11 10. The adaptor system as recited in claim 9, wherein the custom adaptor  
12 interface and the custom peripheral interface have a rotatable fixable coupling via  
13 continuous circular slide connectors, wherein the coupling allows for continuous  
14 reorienting of the peripheral.  
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2 11. A coupling system for orienting an attached peripheral device, the system  
3 comprising:

4 a digital device having an interface with a specified orientation;

5 a peripheral device having an operable orientation;

6 a connector for electrically and mechanically coupling to the interface to  
7 receive communication signals for the peripheral device; and

8 an orienting coupling interface rigidly attached to the connector, the  
9 orienting coupling interface having at least one contact for each signal received by  
10 the connector and operably orienting to connect with the attached peripheral  
11 device in the desired orientation.

12 12. The coupling system as recited in claim 11, wherein the selectively  
13 attachable peripheral device is configurable as a bluetooth compatible module enabling  
14 short-range wireless communication, the peripheral device further comprising:

15 a wireless transceiver module electrically connected to the orienting  
16 interface; and

17 a wireless antenna electrically connected to the wireless transceiver  
18 module for transceiving the signals generated by the wireless transceiver module.

19  
20 13. The coupling system as recited in claim 11, wherein the orienting coupling  
21 interface replicates each signal of the interface for each orientation, such that the  
22 orienting coupling interface provides a replicated signal to the peripheral through all  
23 ranges of orientation.  
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14. The coupling system as recited in claim 11, wherein the orienting coupling interface is a circular contact joint that facilitate re-orientation of the peripheral device and the connector.

1  
2 15. An adaptor for electrically coupling a peripheral device with a computer,  
3 said peripheral device having a peripheral interface with an operable orientation and said  
4 computer having a computer interface in a fixed orientation, said adaptor comprising:

5 a. a computer interface plug for electrically and mechanically  
6 coupling with said computer interface in said fixed orientation;

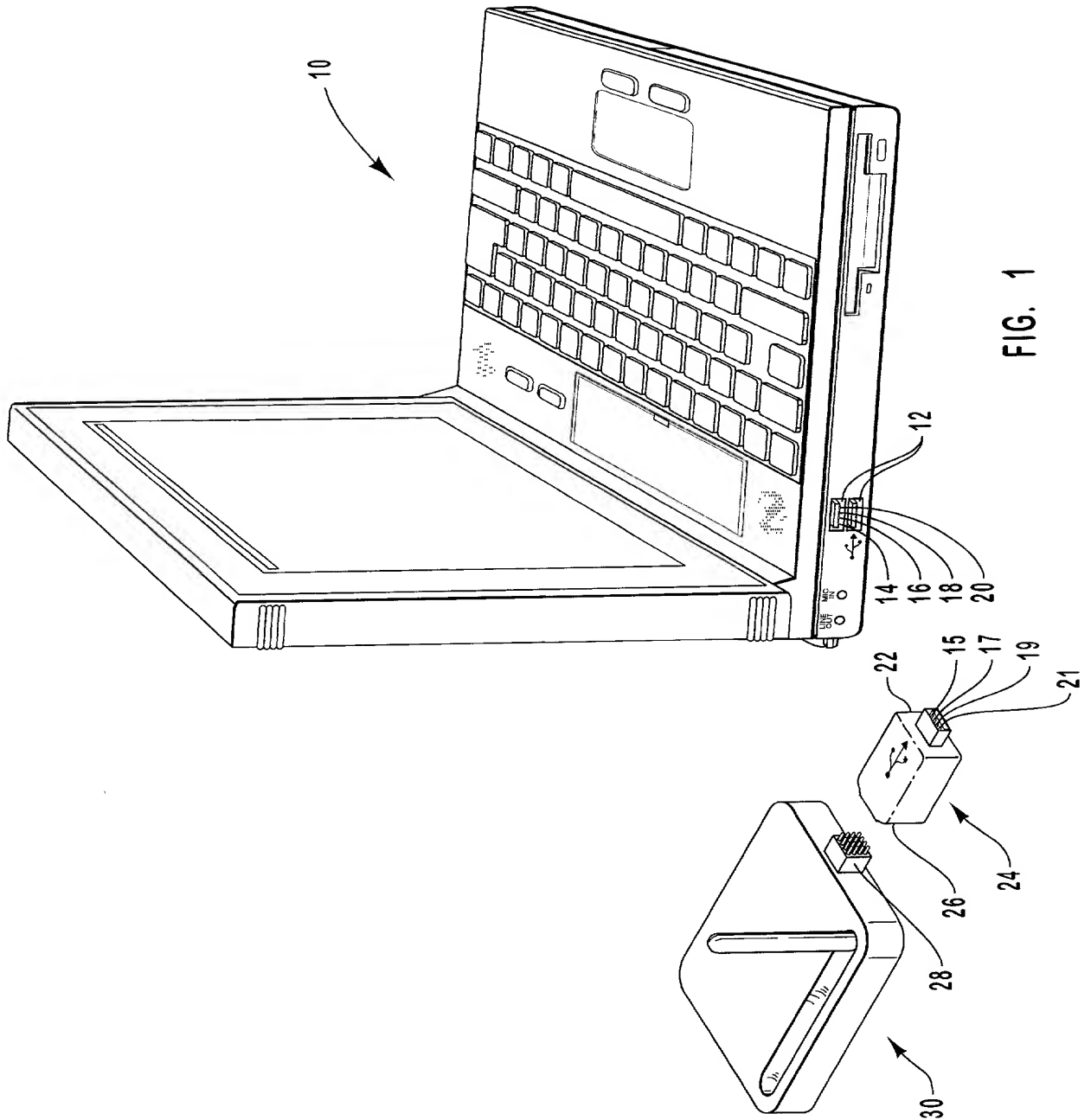
7 b. a peripheral interface plug for electrically and mechanically  
8 coupling with said peripheral interface in said operable orientation; and

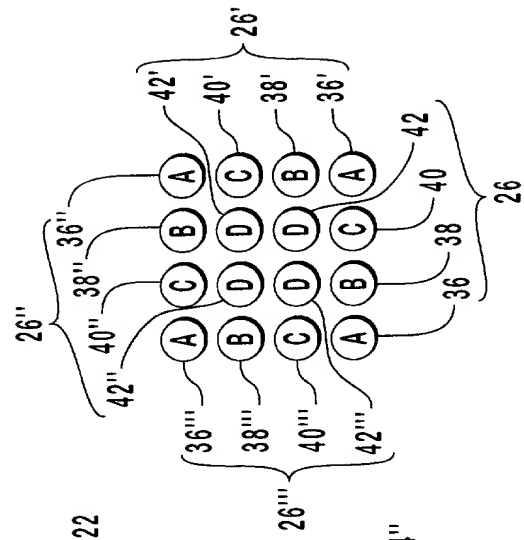
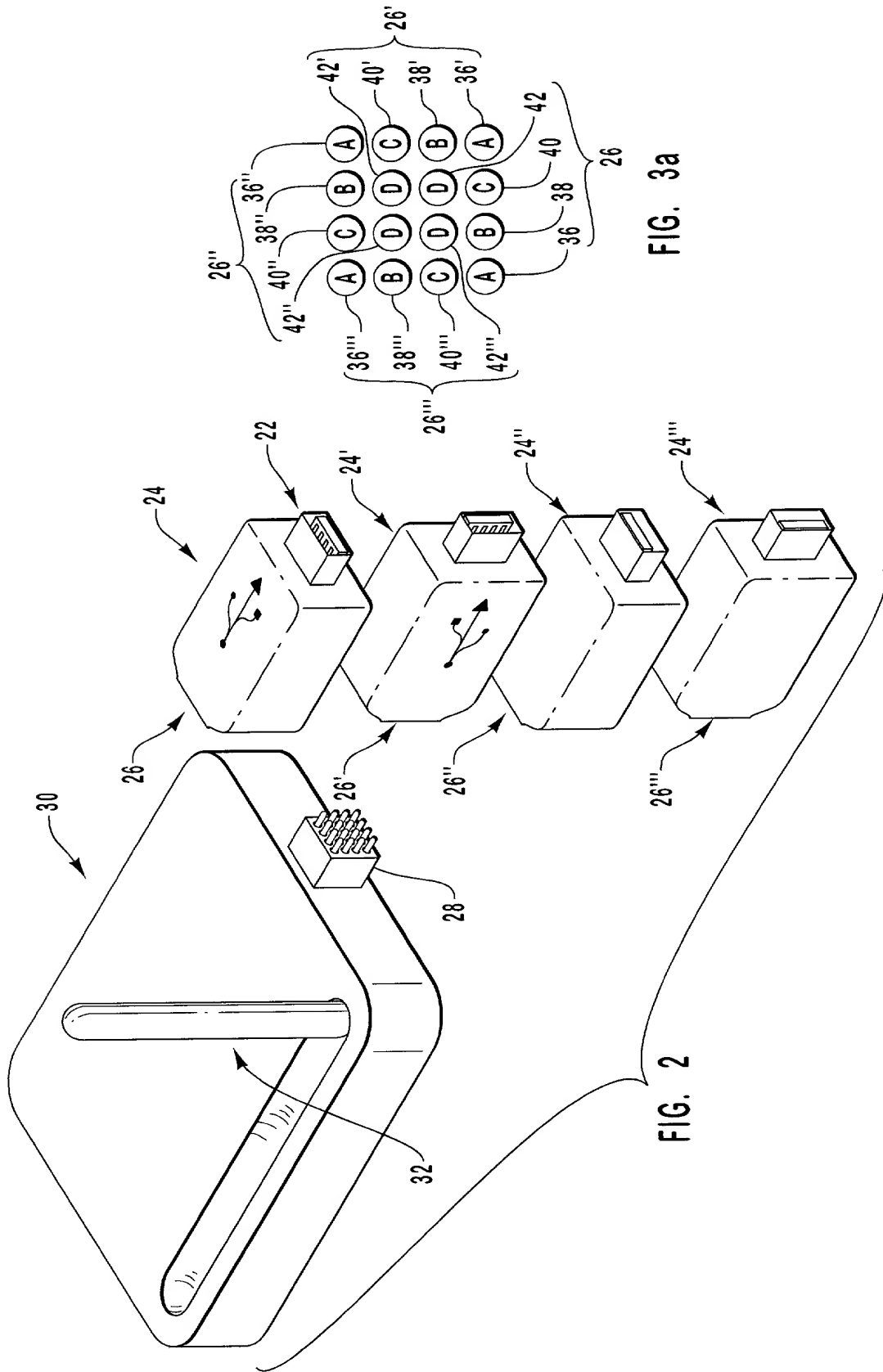
9 c. a contact coupling electrically and mechanically coupled between  
10 said computer interface plug and said peripheral interface plug, said contact  
11 coupling rotating one of said computer interface plug and said peripheral interface  
12 plug to mechanically and electrically retain said computer interface in said fixed  
13 orientation and facilitate said peripheral device in said operable orientation.  
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**ABSTRACT OF THE INVENTION**

An adapter mechanism for facilitating re-orientation of a plug having an original orientation that is unsuitable for a peripheral device is presented. Re-orientation of a peripheral device is possible in an embodiment by advancing a symmetrical interface to another mating position exhibiting a hospitable orientation. An adaptor maintains USB functionality while providing the ability to reorient a fixedly attached peripheral. The adaptor mechanism also allows a USB wireless peripheral device with an antenna to plug directly into the USB receptacle connector on a digital device while orienting the antenna upwards to improve the quality of the transmitted and received signals.

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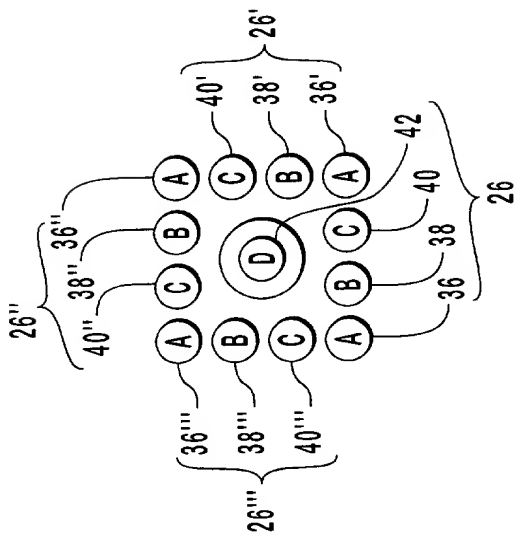


FIG. 3c

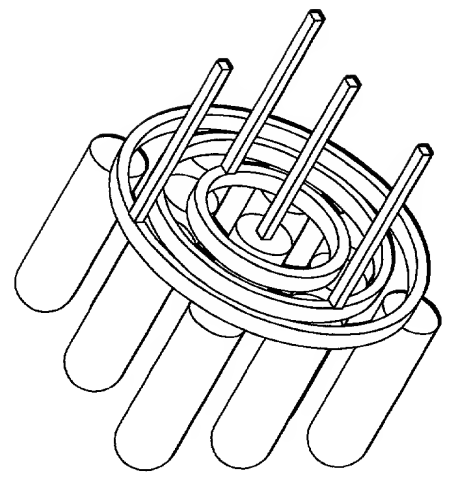


FIG. 3e

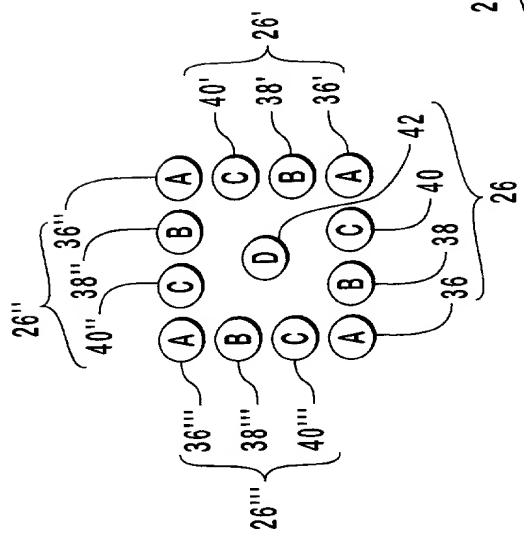


FIG. 3b

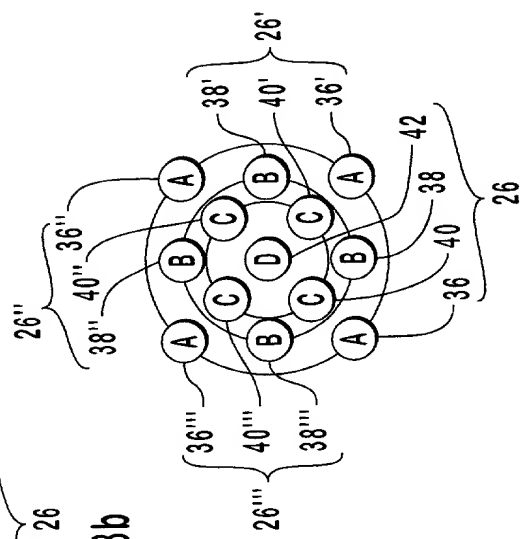


FIG. 3d

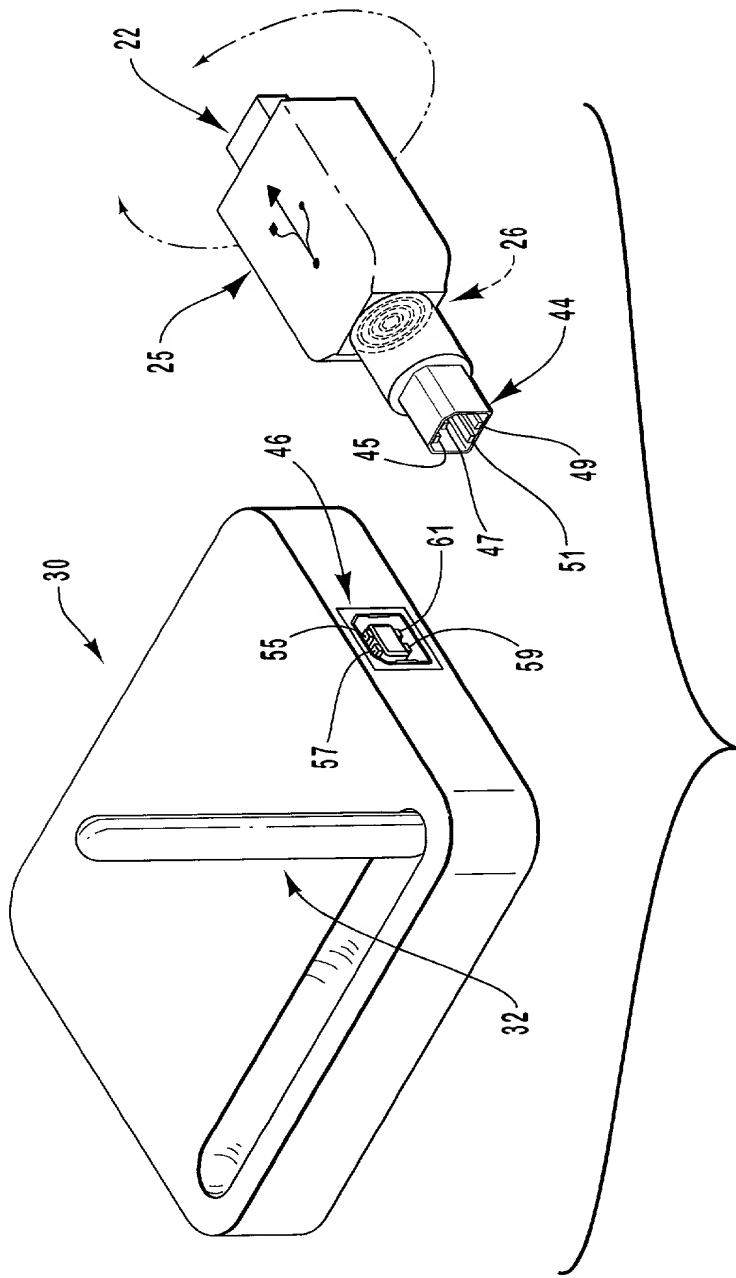


FIG. 4

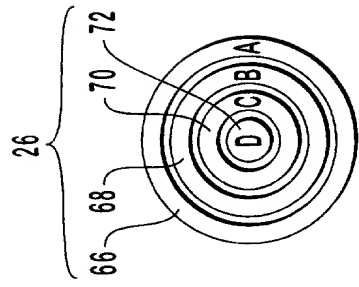


FIG. 5

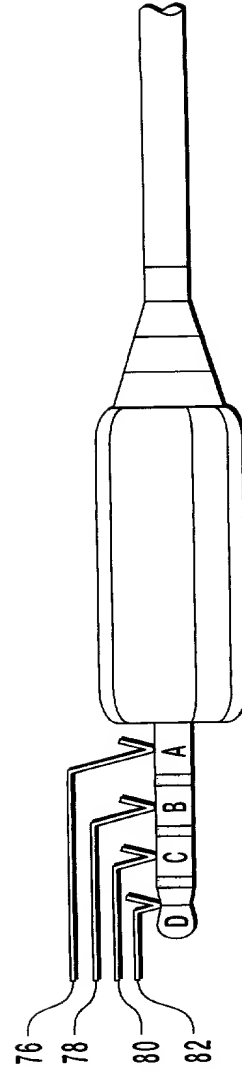


FIG. 6

DECLARATION, POWER OF ATTORNEY, AND PETITION

We,

- (1)    Name:        Kenneth S. Morley  
       Address:     11567 South Thornberry Ct.  
                     Draper, Utah 84020  
       Citizenship:  United States of America
- (2)    Name:        Scott M. Christensen  
       Address:

Citizenship:    United States of America

declare: that our citizenship, residence address, and post office address are as set forth above; that we verily believe we are the original, first, and joint inventors of the subject matter of the invention or discovery entitled CONNECTOR SCHEME TO ALLOW PHYSICAL ORIENTATION OF A COMPUTER PERIPHERAL for which a patent is sought and which is described and claimed in the specification attached hereto; that we have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to herein; and that we acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Section 1.56(a) of Title 37 of the Code of Federal Regulations.

We declare further that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that



such willful, false statements may jeopardize the validity of the application or any patent issuing thereon.

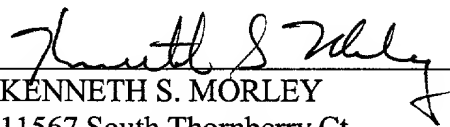
We hereby appoint as our attorneys and/or patent agents: RICK D. NYDEGGER, Registration No. 28,651; DAVID O. SEELEY, Registration No. 30,148; JONATHAN W. RICHARDS, Registration No. 29,843; JOHN C. STRINGHAM, Registration No. 40,831; BRADLEY K. DeSANDRO, Registration No. 34,521; JOHN M. GUYNN, Registration No. 36,153; CHARLES L. ROBERTS, Registration No. 32,434; GREGORY M. TAYLOR, Registration No. 34,263; DANA L. TANGREN, Registration No. 37,246; KEVIN B. LAURENCE, Registration No. 38,219; ERIC L. MASCHOFF, Registration No. 36,596; C. J. VEVERKA, Registration No. 40,858; ROBYN L. PHILLIPS, Registration No. 39,330; RICHARD C. GILMORE, Registration No. 37,335; DAVID B. DELLENBACH, Registration No. 39,166; JOHN N. GREAVES, Registration No. 40,362; KEVIN K. JOHANSON, Registration No. 38,506; DAVID L. GRIFFIN, Registration No. 44,136; R. BURNS ISRAELSEN, Registration No. 42,685; DAVID R. TODD, Registration No. 41,348; JESÚS JUANÓS i TIMONEDA, Registration No. 43,332; STEPHEN D. PRODNUK, Registration No. 43,020; R. PARRISH FREEMAN, JR., Registration No. 42,556; ADRIAN J. LEE, Registration No. 42,785; and KYLE H. FLINDT, Registration No. 42,539, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. All correspondence and telephonic communications should be directed to:

Kevin K. Johanson  
WORKMAN, NYDEGGER & SEELEY  
1000 Eagle Gate Tower  
60 East South Temple  
Salt Lake City, Utah 84111  
Telephone: (801) 533-9800  
Facsimile: (801) 328-1707

Wherefore, we pray that Letters Patent be granted to us for the invention or discovery described and claimed in the foregoing specification and claims, declaration, power of attorney, and this petition.

DATED this 8 day of SEPTEMBER 2000.

Inventor:

  
KENNETH S. MORLEY  
11567 South Thornberry Ct.  
Draper, Utah 84020

Wherefore, we pray that Letters Patent be granted to us for the invention or discovery described and claimed in the foregoing specification and claims, declaration, power of attorney, and this petition.

DATED this 8 day of September 2000.

Inventor:

Scott M. Christensen  
SCOTT M. CHRISTENSEN